MATH 0310

Section 18.3 Absolute-Value Equations and Inequalities Supplement

Objective: Evaluate an Absolute Value Expression.

Absolute Value

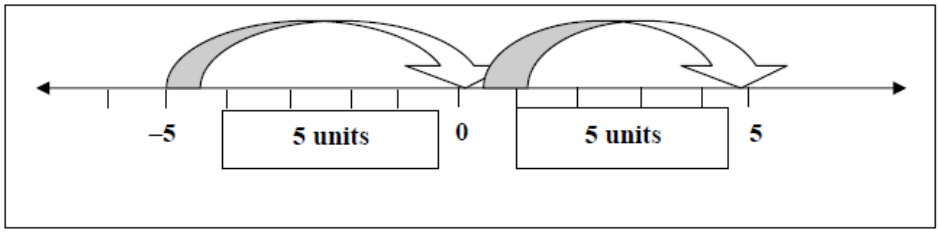
The absolute value of x, denoted $|x|$, is defined as

$$|x| = \begin{cases} x, & \text{if } x \geq 0 \\ -x & \text{if } x < 0 \end{cases}$$

Essentially, we are looking at the distance from zero on the number line.

For example: $|5| = 5$

$|-5| = 5$



So even though 5 and -5 are different they have the same absolute value.

Note that $|x|$ is always nonnegative.

Critical Thinking:

1. What is the value of $\frac{x}{|x|}$ when x is positive?

2. What is the value of $\frac{x}{|x|}$ when x is negative?

3. Are there any values of x that would make the following true? $|3x+7| = -4$

Recall that **evaluating** algebraic expressions means to **substitute** a number for each variable in the expression and calculate the result.

For example: Evaluate $|x+y|$, use $x=3$, and $y=-5$

Solution: $|3+(-5)|=|-2|=2$

More examples:

1. Evaluate the following expression when $v=-3$

   $12-|2v|$

Solution:

$12-|2(-3)|$
$12-|-6|$
$12-6=6$

2. Evaluate the following expression when $m=4$, $n=-4$ and $p=-4$

   $3-(p+|m-n|)$

Solution:

$3-(-4+|4-(-4)|)$
$3-(-4+|8|)$
$3-(-4+8)$
$3-4=-1$

You try:

1. **Evaluate** $-3|2t+6|$ if $t=-1$

2. Evaluate $|6x+y|$ if $x=-2$ and $y=3$

3. Evaluate $|-x|-|-y|$ if $x=-2$ and $y=3$

Answers:

1. -12

2. 9

3. -1

Note about the TI 83/84 Graphing Calculator:

To find the absolute value of a number, press [MATH], arrow ([▶]) to **NUM**eric, select **1:abs(** and press [ENTER].

For the **older versions of TI-83/84**, **abs(** will be on your home screen. Type the numerical express you want to take the absolute value of, press the right parentheses [)] and then press [ENTER].

For the **newer TI-84s**, when you select [MATH] [▶][ENTER], absolute value bars will appear on the home screen. Type the numerical expression you want to find the absolute value of and press [ENTER].